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UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/664,499	09/18/2000	Nicos A. Vekiarides	1942.0040000	4607

			EXAMINER
22879　7590　10/04/2004			EL CHANTI, HUSSEIN A

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FORT COLLINS, CO 80527-2400

ART UNIT	PAPER NUMBER
2157	

DATE MAILED: 10/04/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

	Application No.	Applicant(s)
Office Action Summary	09/664,499	VEKIARIDES, NICOS A.
	Examiner	Art Unit	
	Hussein A El-chanti	2157	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>8/3/2004</u>.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>1-43</u> is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>1-43</u> is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
    Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____.

DETAILED ACTION

1.   This action is responsive to communication received on August 3, 2004. Claims

1-43 are pending examination.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2.   Claim 24 is rejected under 35 U.S.C. 102(e) as being anticipated by Ofek, U.S.

Patent No. 6,654,752.

As to claim 24, Ofek teaches a method of bi-directional mirroring of data in

computer networks, comprising the steps of:

establishing a first connection between a local storage server and a

remote storage server (see col. 7 lines 55-col. 8 lines 11);

establishing a second connection between the local storage server and

the remote storage server (see col. 7 lines 55-col. 8 lines 11):

receiving a first local storage request from a first network host at the local

storage server (see col. 8 lines 37-57);

sending a first local mirror storage request from the local storage server

across the first connection, wherein the first local mirror storage request corresponds to

the first received local storage request (see col. 10 lines 64-col. 11 lines 17);

receiving the first local mirror storage request at the remote storage serve

(see col. 8 lines 37-57)r;

storing data received in the first local mirror storage request in at least

one remote storage device coupled to the remote storage server (see col. 7 lines 55-

col. 8 lines 11);

receiving a first remote storage request from a second network host at the

remote storage server (see col. 8 lines 37-57);

sending a first remote mirror storage request from the remote storage

server across the second connection, wherein the first remote mirror storage request

corresponds to the received first remote storage request (see col. 8 lines 37-57);

receiving the first remote mirror storage request at the local storage

server (see col. 8 lines 37-57); and

storing data received in the first remote mirror storage request in at least

one local storage device coupled to the local storage server (see col. 10 lines 64-col. 11

lines 17).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set
forth in section 102 of this title, if the differences between the subject matter sought to be patented and
the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains.
Patentability shall not be negatived by the manner in which the invention was made.

2.   Claims 1-22 and 25-43 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Ofek, U.S. Patent No. 6,654,752.

As to claim 1, Ofek teaches a method of mirroring data in a computer network,

comprising the steps of:

establishing at least one connection between a local storage server and a

mirror storage server (see col. 7 lines 55-col. 8 lines 11);

receiving a primary storage request from a network host at the local

storage server (see col. 8 lines 37-57);

sending a mirror storage request across the established at least one

connection from the local storage server to the mirror storage server, wherein the mirror

storage request corresponds to the received primary storage request (see col. 8 lines

37-57);

processing the mirror storage request at the mirror storage server (see

col. 8 lines 37-57);

sending a first signal from the local storage server to the mirror storage

server (see col. 10 lines 64-col. 11 lines 17); and

sending, a second signal from, the mirror storage server to the local

storage sever (see col. 10 lines 64-col. 11 lines 17).

Ofek sends a signal from the local storage and awaits an

acknowledgement from the mirror storage. Ofek does not explicitly teach the first and

second signals are heartbeats. Official notice is taken that one of the ordinary skills in

the art at the time of the invention would be motivated to send a signal instead of a

signal and an acknowledgment because doing so would perform the same function and

that is to check whether the mirror storage is online and that the data can be sent or

that the data was received successfully.

As to claim 2, Ofek teaches the method of claim 1 further comprising the steps

of:

detecting an interruption in the second signal at the local storage server

(see col. 11 lines 52-67);

closing the established at least one connection; and queuing mirror

storage requests that result from primary storage requests that are received during the

detected interruption (see col. 11 lines 52-67).

As to claims 3 and 41, Ofek teaches the method of claim 2, further comprising

the steps of:

receiving the-second signal at the local storage server after the detected

interruption of the second signal (see col. 12 lines 54-col. 13 lines 30); and

re-establishing the closed at least one connection between the local

storage server and the mirror storage server (see col. 12 lines 54-col. 13 lines 30).

As to claims 4 and 42, Ofek teaches the method of claim 3, wherein said mirror

storage request sending step comprises the step of:

sending the queued mirror storage requests across the re-established at

least one connection after said re-establishing step (see col. 12 lines 54-col. 13 lines

30).

As to claim 5, Ofek teaches detecting an interruption in the second signal at the local storage server that has a duration longer than a first predetermined amount of time (see col. 11 lines 53-67).

As to claim 6, Ofek teaches the method of claim 3, wherein said re-establishing step comprises the steps of:

re-establishing the closed at least one connection between the local storage server and the mirror storage server only if no interruptions in the second signal are detected during said monitoring step monitoring the second signal for a probationary interval of time (see col. 11 lines 53-67).

As to claim 7, Ofek teaches the method of claim 1 wherein said processing step comprises the step of:

storing data of the received mirror storage request in a mirror storage device corresponding to a primary storage device (see col. 8 lines 37-57).

As to claims 8 and 43, Ofek teaches the method of claim 7, further comprising the step of:

sending a response across the established at least one connection from the mirror storage server to the local storage server, wherein the response indicates whether said storing data step was successful (see col. 13-col. 14).

As to claim 9, Ofek teaches the method of claim 5, wherein said establishing step comprises the steps of:

establishing n connections between the local storage server and the mirror storage server, wherein each of the n connections is between one of n worker

threads in the local storage server and one of n connection threads in the mirror

storage server, wherein $n >= 1$;

storing a local connection array of n elements on the local storage server,

wherein each element of the local connection array corresponds to one of the n local

worker thread that operates on the local storage server; and

storing a mirror connection array of n elements on the mirror storage

server, wherein each element of the mirror connection array corresponds to one of the

n connection threads on the mirror storage server (see col. 10-col. 11).

As to claims 10, 33 and 34, Ofek teaches the method of claim 9, wherein said

local connection array storing step comprises the step of

storing a local connection array of n elements wherein each element

comprises a socket and a timestamp: and

wherein said mirror connection array storing step comprises the step of:

storing a mirror connection array of n elements, wherein each element

comprises a socket parameter and a timestamp parameter (see col. 5 lines 17-45).

As to claim 11, Ofek teaches the method of claim 10, wherein said establishing

step further comprises the step of:

establishing each of the n connections according to the socket parameter

stored in the corresponding one of the n elements of the stored local connection array

(see col. 10-col. 11).

As to claim 12, Ofek teaches the method of claim 11, further comprising the

steps of:

establishing a mirror sender thread and a mirror receiver thread in the mirror storage server; and

establishing a local sender thread and a local receiver thread in the local storage server (see col. 10-col. 11).

As to claim 13, Ofek teaches the method of claim 12, wherein the first signal sending step and said second signal sending step each further comprise the step of:

sending a message at time intervals of a second predetermined amount of time (see col. 5 and col. 10-col. 11).

As to claims 14 and 36, Ofek teaches the method of claim 13, wherein said first signal sending step further comprises the step of:

updating the timestamp parameter of each of the n elements of the mirror connection array whenever the message on the first signal is received by the mirror receiver thread; and

wherein said second signal sending step further comprises the step of:

updating the timestamp parameter of each of the n elements of the local connection array whenever the message on the second signal is received by the local receiver thread (see col. 5 and col. 10-col. 11).

As to claims 15 and 37, Ofek teaches the method of claim 14, wherein said detecting step further comprises the step of:

indicating in one of the n elements of the mirror connection array that the corresponding one of the established n connections is closed if the timestamp

parameter of the one of the *n* elements is older than the first predetermined amount of time (see col. 5 and col. 10-col. 11).

As to claims 16 and 38, Ofek teaches the method of claim 15, wherein said closing step comprises the steps of

timing out one of the *n* connection threads on the mirror storage server if a request on the corresponding one of the established *n* connections has not arrived in a third predetermined amount of time; and

closing and exiting the timed out connection thread if the corresponding one of the *n* elements in the min-or connection array is indicated to be closed (see col. 5 and col. 10-col. 11).

As to claim 17, Ofek teaches the method of claim 16, further comprising the steps of

receiving a first message on the first signal after an interruption of the first signal (see col. 13-col. 14); and

re-establishing the n connections between the local storage server and the corresponding connection threads on the mirror storage server (see col. 13-col. 14).

As to claim 18, Ofek teaches the method of claim 17 wherein said second signal receiving step comprises the step of:

receiving a first message on the second signal after an interruption of the second signal (see col. 13-col. 14).

As to claim 19, Ofek teaches the method of claim 1, wherein the local storage server is operating in an asynchronous mirror mode, further comprising the steps of:

processing the primary storage request, and

sending the results of the processed primary storage request to the network host (see col. 13-col. 14).

As to claim 20, Ofek teaches the method of claim 1, wherein the local storage server is operating in a synchronous mirror mode, further comprising the steps of:

processing the primary storage request;

waiting for a response corresponding to the sent mirror storage request from the mirror storage server; and

sending the results of the processed primary storage request to the network host after the response is received from the mirror storage server (see fig. 3).

As to claim 21, Ofek teaches the method of claim 1, further comprising the step of:

determining whether a LUN related to the received primary storage request is designated to be mirrored (see fig. 10).

As to claim 22, Ofek does not explicitly teach the established at least one connection is a TCP connection. Official notice is taken that one of the ordinary skill in the art at the time of the invention would be motivated to use Ofek's invention using a TCP connection because it adds reliable communication and flow control and provides full-duplex process-to-process connections.

As to claim 25, Ofek teaches sending a first signal from the local storage server to the mirror storage server (see col. 10 lines 64-col. 11 lines 17); and

sending, a second signal from, the mirror storage server to the local storage sever (see col. 10 lines 64-col. 11 lines 17).

Ofek sends a signal from the local storage and awaits an acknowledgement from the mirror storage. Ofek does not explicitly teach the first and second signals are heartbeats. Official notice is taken that one of the ordinary skills in the art at the time of the invention would be motivated to send a signal instead of a signal and an acknowledgment because doing so would perform the same function and that is to check whether the mirror storage is online and that the data can be sent or that the data was received successfully.

As to claim 26, Ofek teaches detecting an interruption in the second signal at the local storage server (see col. 11 lines 52-67);

closing the established at least one connection; and queuing mirror storage requests that result from primary storage requests that are received during the detected interruption (see col. 11 lines 52-67).

As to claim 27, Ofek teaches detecting an interruption in the second signal at the local storage server (see col. 11 lines 52-67);

receiving the-second signal at the local storage server after the detected interruption of the second signal (see col. 12 lines 54-col. 13 lines 30); and

re-establishing the closed at least one connection between the local storage server and the mirror storage server (see col. 12 lines 54-col. 13 lines 30).

As to claim 28, Ofek teaches said mirror storage request sending step comprises the step of:

sending the queued mirror storage requests across the re-established at least one connection after said re-establishing step (see col. 12 lines 54-col. 13 lines 30).

As to claim 29, Ofek teaches detecting an interruption in the second signal at the local storage server that has a duration longer than a first predetermined amount of time (see col. 11 lines 53-67).

closing the established at least one connection; and queuing mirror storage requests that result from primary storage requests that are received during the detected interruption (see col. 11 lines 52-67).

As to claim 30, Ofek teaches receiving a first signal at the remote storage server after the detected interruption of the first signal; and

Re-establishing the closed second connection between the local storage server and the mirror storage server (see col. 10-col. 11)

As to claim 31, Ofek teaches sending the queued at least a second remote mirror storage request across the re-established second connection after said re-establishing step (see col. 13-col. 14).

As to claim 32, Ofek teaches a system for mirroring data in a computer network, comprising:

a local storage server that receives a storage request and outputs a mirror storage request, wherein said local storage server outputs a first signal; and

a mirror storage server that receives said mirror storage request, wherein

said mirror storage server processes said mirror storage request, wherein said mirror

storage server outputs a response corresponding to said mirror storage request to said

local storage server, wherein said mirror storage server outputs a second signal and

receives said first signal;

wherein said local storage server receives said second signal (see col. 7

lines 55-col. 8 lines 11, col. 10 lines 64-col. 11 lines 17 and col. 12 lines 54-col. 13 lines

30).

Ofek sends a signal from the local storage and awaits an acknowledgement from

the mirror storage. Ofek does not explicitly teach the first and second signals are

heartbeats. Official notice is taken that one of the ordinary skills in the art at the time of

the invention would be motivated to send a signal instead of a signal and an

acknowledgment because doing so would perform the same function and that is to

check whether the mirror storage is online and that the data can be sent or that the

data was received successfully.

As to claim 35, Ofek teaches the method of claim 11, further comprising the

steps of:

establishing a mirror sender thread and a mirror receiver thread in the

mirror storage server; and

establishing a local sender thread and a local receiver thread in the local

storage server (see col. 10-col. 11).

Wherein said local sender sends said first signal to said mirror receiver thread (see col. 10-col. 11).

As to claim 39, Ofek teaches a computer program product comprising a computer useable medium having computer program logic recorded thereon for enabling at least one processor to mirror data in a computer network, said computer program logic comprising:

means for enabling the processor to establish at least one connection between a local storage server and a mirror storage server;

means for enabling the processor to receive a primary storage request from a network host at the local storage server;

means for enabling the processor to send a mirror storage request across the established at least one connection from the local storage server to the mirror storage server, wherein the mirror storage request corresponds to the received primary storage request (see col. 7 lines 9-16 and col. 7 lines 63-col. 8 lines 11. col. 5 lines 23-33);

means for enabling the processor to send a first signal from the local storage server to the mirror storage server; and

means for enabling the processor to send a second signal from the mirror storage server to the local storage server (see col. 7 lines 55-col. 8 lines 11, col. 10 lines 64-col. 11 lines 17 and col. 12 lines 54-col. 13 lines 30).

Ofek sends a signal from the local storage and awaits an acknowledgement from the mirror storage. Ofek does not explicitly teach the first and second signals are

heartbeats. Official notice is taken that one of the ordinary skills in the art at the time of the invention would be motivated to send a signal instead of a signal and an acknowledgment because doing so would perform the same function and that is to check whether the mirror storage is online and that the data can be sent or that the data was received successfully.

As to claim 40, Ofek teaches the method of claim 1 further comprising the steps of:

detecting an interruption in the second signal at the local storage server (see col. 11 lines 52-67);

queuing mirror storage requests that result from primary storage requests that are received during the detected interruption (see col. 11 lines 52-67).

3.   Claims 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ofek in view of Bennett, U.S. Patent No. 6,633,587.

Ofek teaches sending a message at time intervals of a second predetermined amount of time. Ofek does not explicitly teach the limitation "sending UDP protocol message". However Bennett teaches a method for sending and receiving UDP messages between a host and a mirror server (see col. 5 lines 55-col. 6 lines 19).

It would have been obvious for one of the ordinary skill in the art at the time of the invention to modify Ofek by implementing the step of sending UDP messages as taught by Bennett because doing so would allow the user to send request to host servers more efficiently and in a faster manner.

4.   Applicant's arguments with respect to the pending claims have been considered

but are moot in view of the new grounds of rejection.

5.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Hussein A El-chanti whose telephone number is

(703)305-4652. The examiner can normally be reached on Mon-Fri 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Ario Etienne can be reached on (703)308-7562. The fax phone number for

the organization where this application or proceeding is assigned is 703-872-9306.

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Hussein El-chanti

Sep. 25, 2004

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